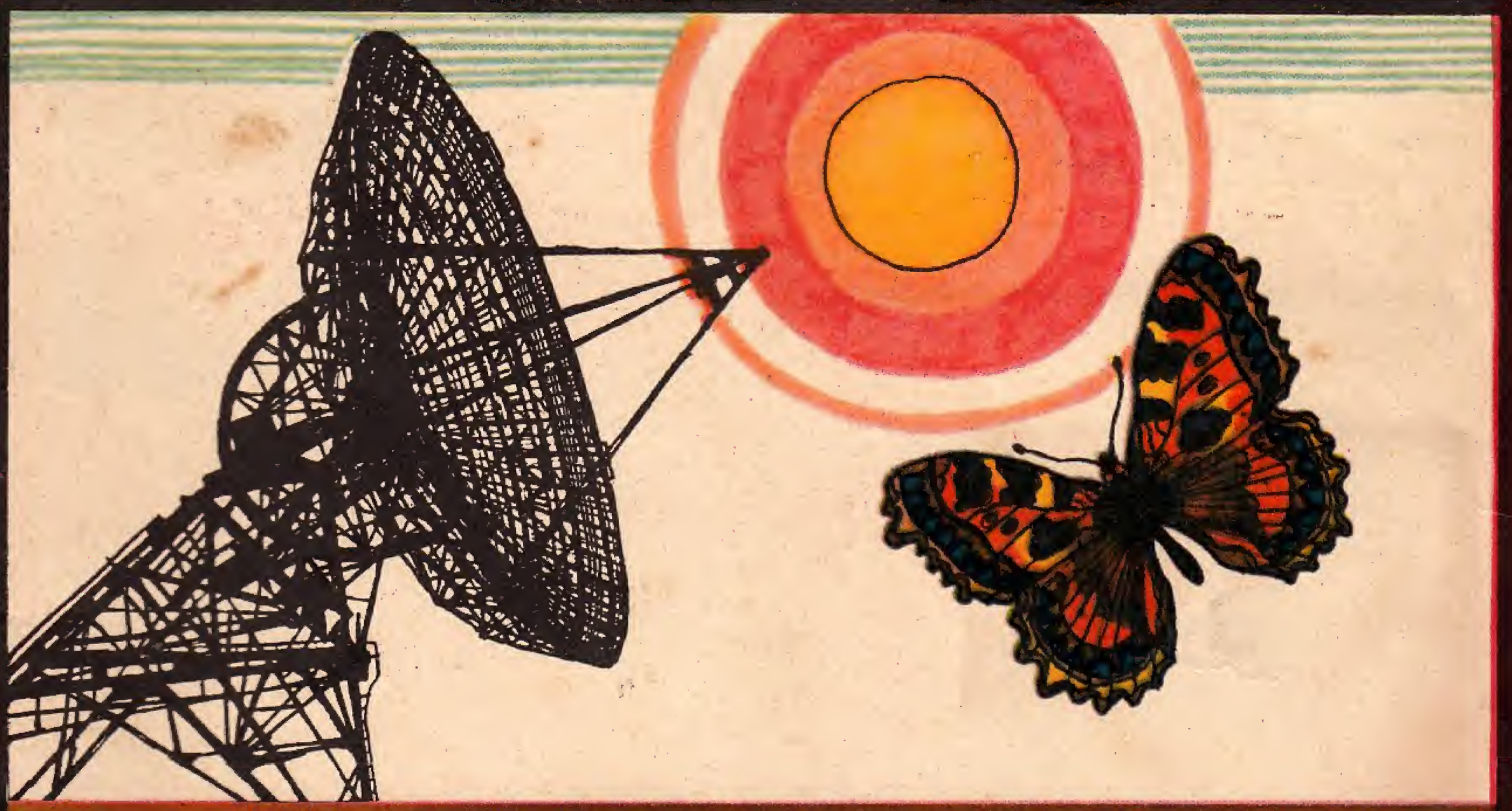
BORIS ZUBKOV

WHAT THE BAT TOLD US



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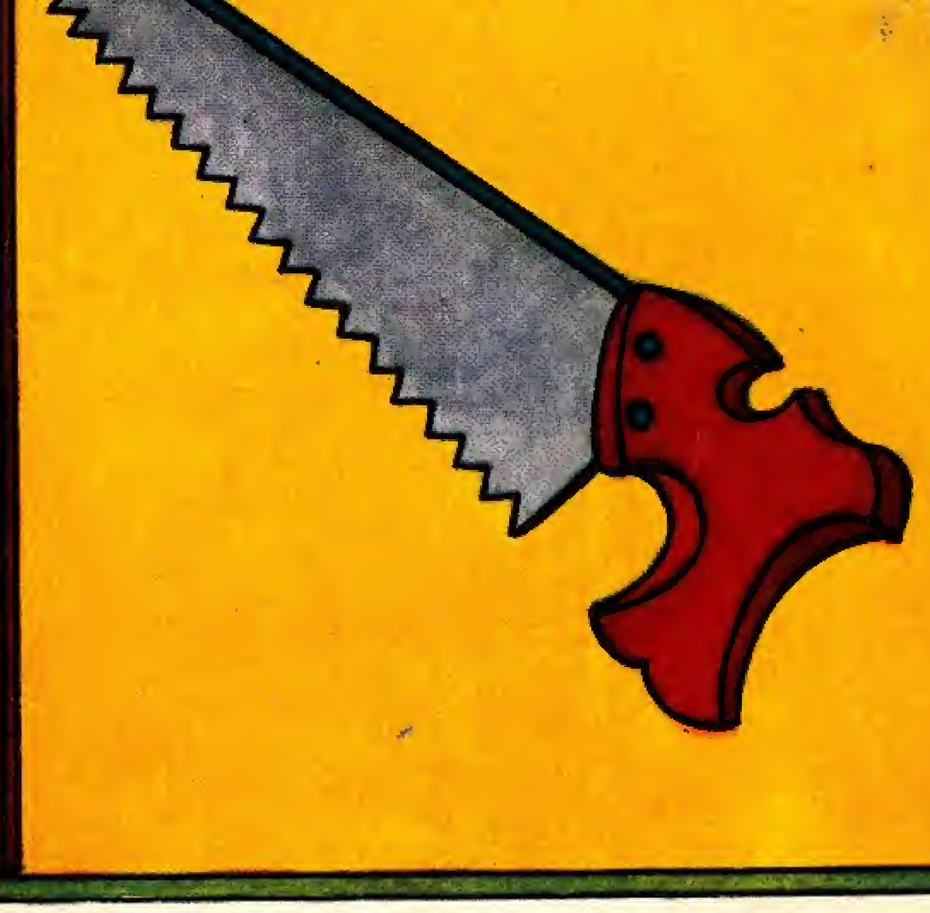
MALYSH PUBLISHERS

HOW THE RAM BECAME A BATTERING RAM, WHAT TIPS ANIMALS GIVE US AND WHERE THE SAW GOT ITS TEETH



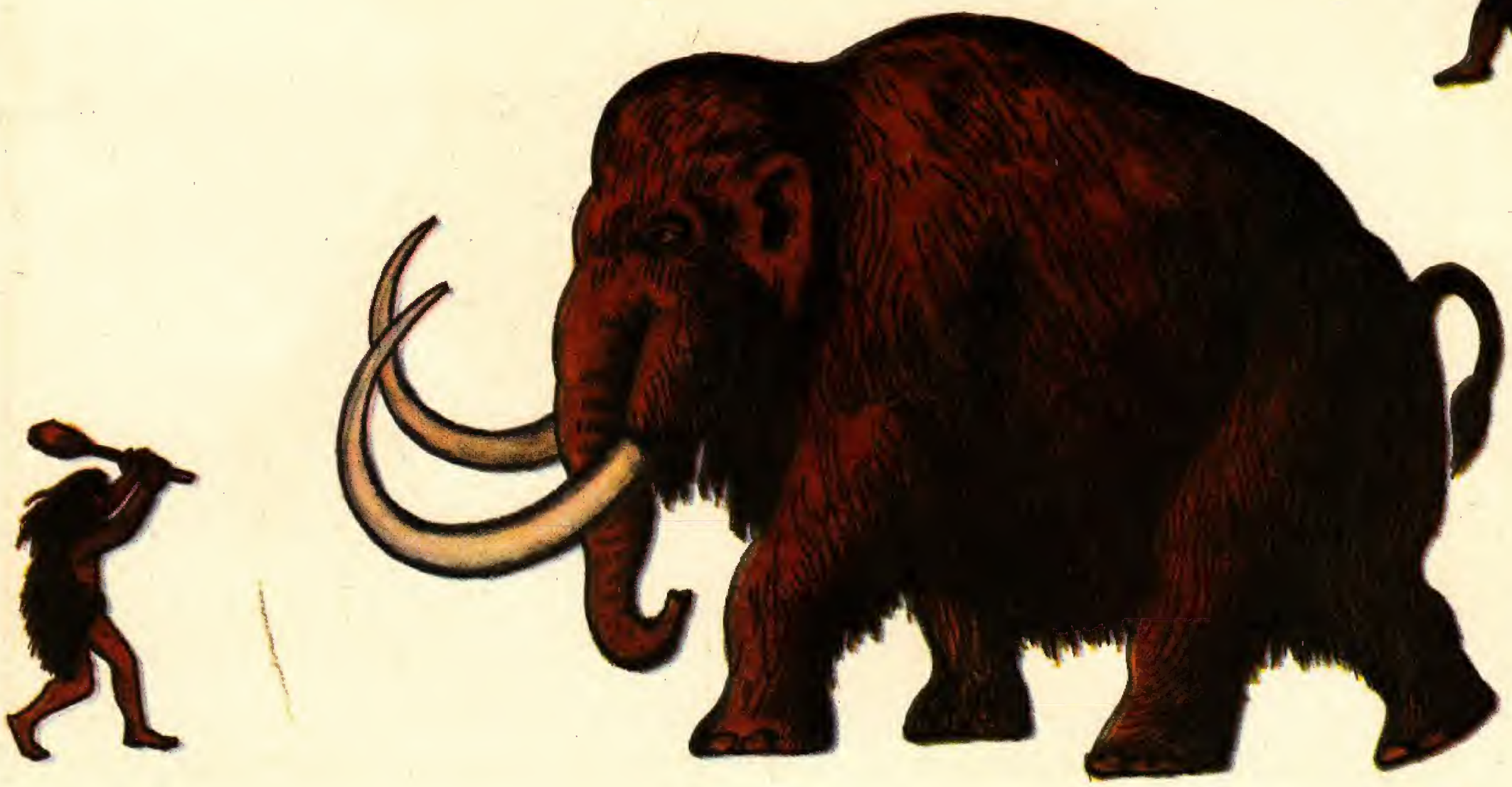
ang! Bang! Bang!

A battering ram is beating down the gates of a besieged fortress, and the gates are giving way. Wood is flying in all directions. At the end of the battering beam there is a ram's head made of copper with short horns and a fat copper forehead.

Why is there a copper head on the beam? The ancient Greeks invented the battering ram with the copper head. They must have noticed how rams fight in the meadow and marveled that rams have such strong heads. So they put a ram's head on the beam used to break down gates. Only this was a head made of copper. The result was very good. Without the copper head the beam itself splintered when it rammed a fortress gate. It could do nothing against the gate.

Long ago people began observing animals, birds, insects and plants. Much that they saw surprised them, and they wondered how to make use of what they saw.

They saw the sharp teeth of the tiger and were envious. Why didn't they have such sharp teeth? They saw the huge tusks of the elephant. What great tusks! They saw the powerful claws of the bear. People have no such teeth, tusks or claws. So they were afraid of the tiger, elephant and bear. But then they began to think that perhaps they could make claws like those of the bear, tusks like those of the elephant, and teeth like those of the tiger.



A knight, a soldier on horseback,
carries a javelin
as sharp as the claw of an animal
but much longer.

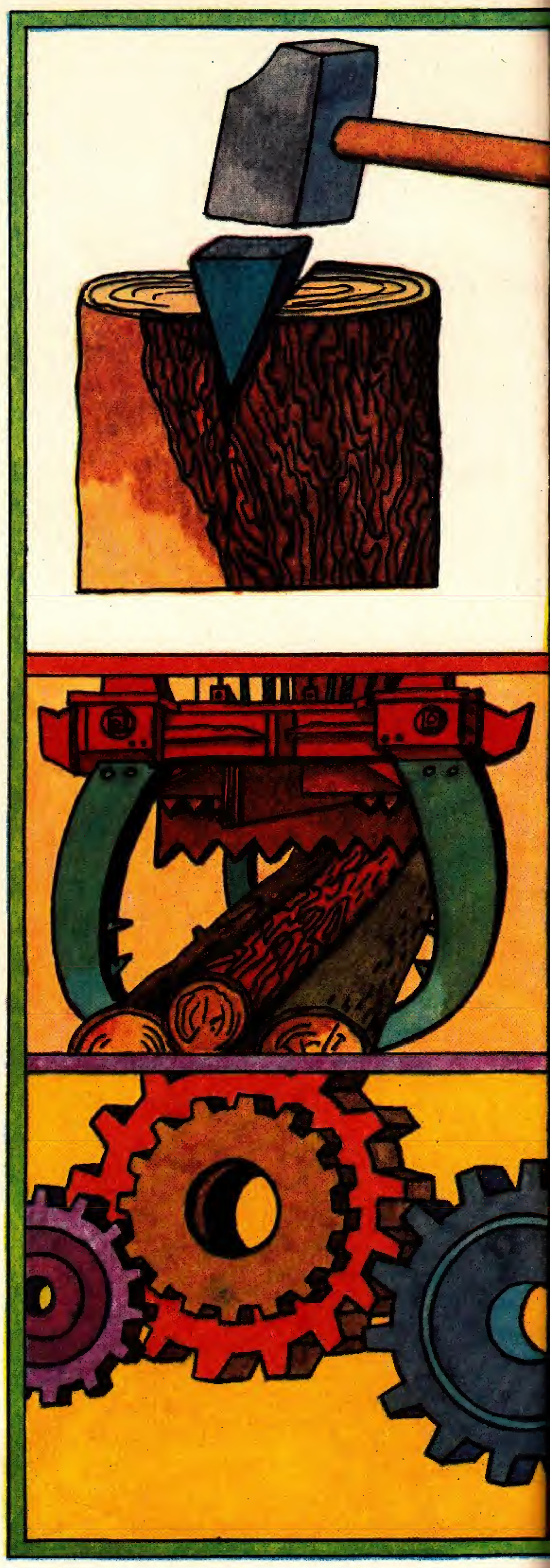
They made a knife from a sharp piece of stone and fastened it to a stick. The result was a javelin. Now they had the sharpest tooth and the longest claw. Watch out, tigers and bears!

A sharp and heavy stone and a sturdy stick made a good ax. And when a few sharp pieces of stone were fitted into a stick, the first saw appeared.

Later people learned to make all these saws, axes and knives out of metal.

To this day we cut metal with a cutting tool, we dig rocks out of the ground with big steel tusks, and we saw wood with sharp teeth.

All the cutters and teeth that people have invented look much like the tusks and teeth of various large and small animals.



YELLOW LEAVES AND KITES, THE SPIDER THAT COULD BUILD BRIDGES, AND WHY MAN DECIDED TO FLY

n the autumn the leaves fade and turn yellow, but they do not want to part from the tree. The wind gets stronger, however, and tears off a leaf and throws it onto the cold ground.

But one leaf has curled up its edges so that it looks almost like a little pipe. The leaf turns its rounded sides to the wind and, though the wind blows from all directions, it cannot pull off the leaf. Why? Pick up a piece of paper by its edge and you will see that it bends. Now roll up the paper to make a pipe. Roll it very tight and try to bend it. Try to break it. Difficult, isn't it? Well, that's why the wind can do nothing with a leaf rolled up into a pipe.

A man once saw such a leaf, and he invented a bridge that looked like a rolled-up leaf.

It was a long bridge, one thousand meters long. And it proved to be very strong because it looked like a leaf rolled up tight into a strong pipe.

Now let's take another look at trees. Between two branches we see

Threads
of a spider web,
chains of a bridge,
and shroud lines
of a parachute
all look much the sam

the thin threads of a spider web. The dew makes them sparkle in the sun. The web is pretty and very strong. A big blue fly may fall into it or a twig from a tree onto it, or the wind may blow, but nothing happens to the web. It goes on swinging back and forth, bending, rocking, but not coming apart.

So people decided to make a bridge that would look like a web but would be made of thick steel rope and chains. The result was a hanging bridge. It was nice to look at and sturdy and did indeed resemble a spider web. Many bridges of this kind are built nowadays.

Some time ago a big sports stadium was built with a roof that hangs on thick steel rope. From a distance it looks very much like a spider web.

If you take a walk in the woods and study everything around you, you will see and learn a lot that is interesting.

The wind may be carrying white fluff across a dale in the woods. But it will look as though tiny white

An airplane became a real airplane
when it was given a propeller.
But for a long time
the wings looked like kites.

A whole group of parachutes
are needed
to bring down a heavy load.

parachutes were coming down, and you can imagine that paratroopers are about to land. The dandelion makes these parachutes to scatter its seeds.

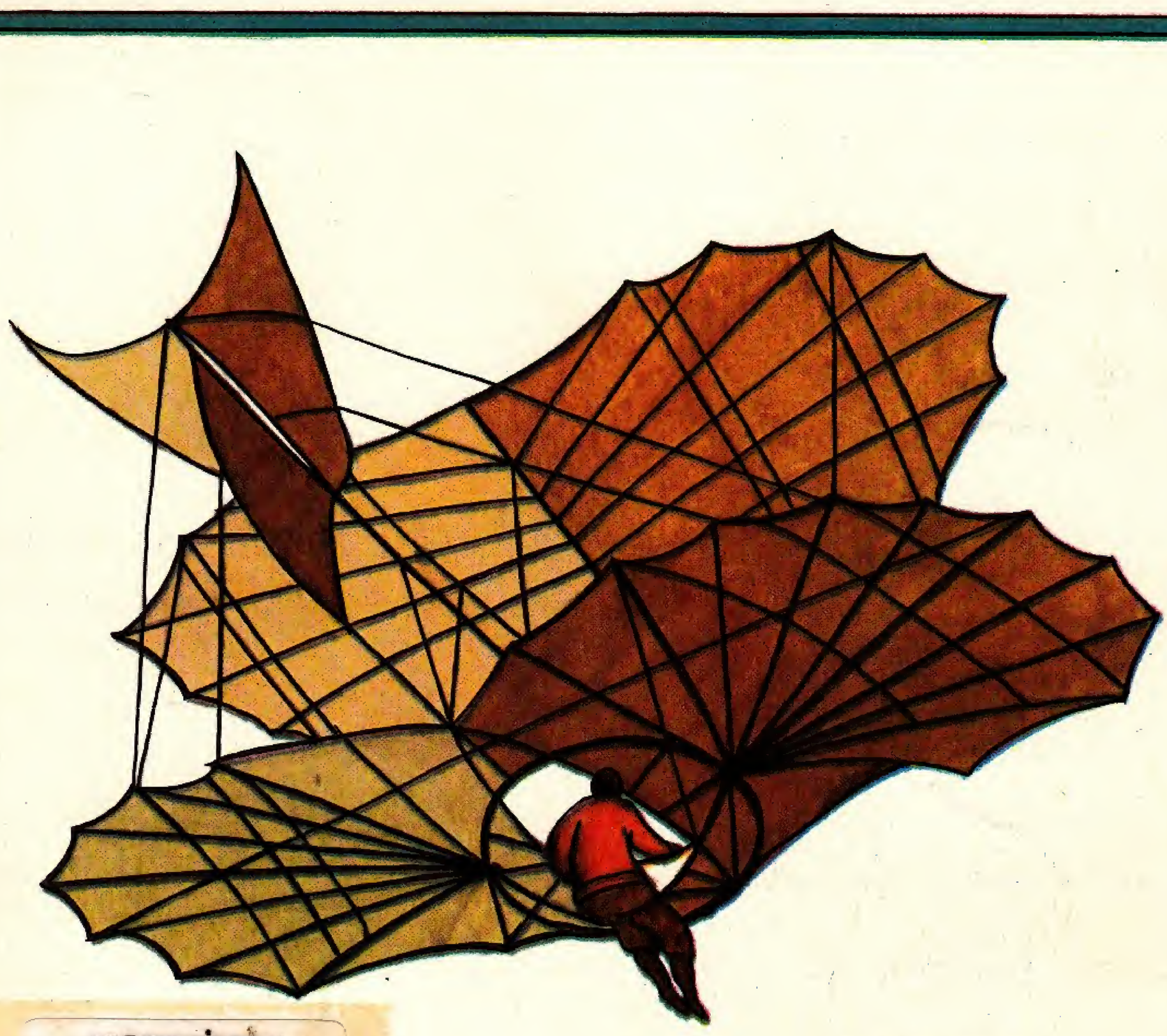
The maple tree too has an invention. These are two curved green blades. They look for all the world like the propeller of a tiny airplane.

Have you ever made a kite? You probably have. And you've thrown your head back and watched while it raced up and up and then, as though it had hit something in the air, began to tumble, only to again go sailing up ever higher.

In a woods in autumn, if you look carefully, you will notice how the wind drives dead leaves in circles on the path. Now look again. The yellow leaves sail along smoothly, then they tremble and change their course as if there were something in the way. Just like a kite. Perhaps people thought up a kite after watching the way the yellow leaves of autumn fly about.

Later people learned to make such big and complicated kites that they

Ballons go where the wind takes them.
They are hard to control.

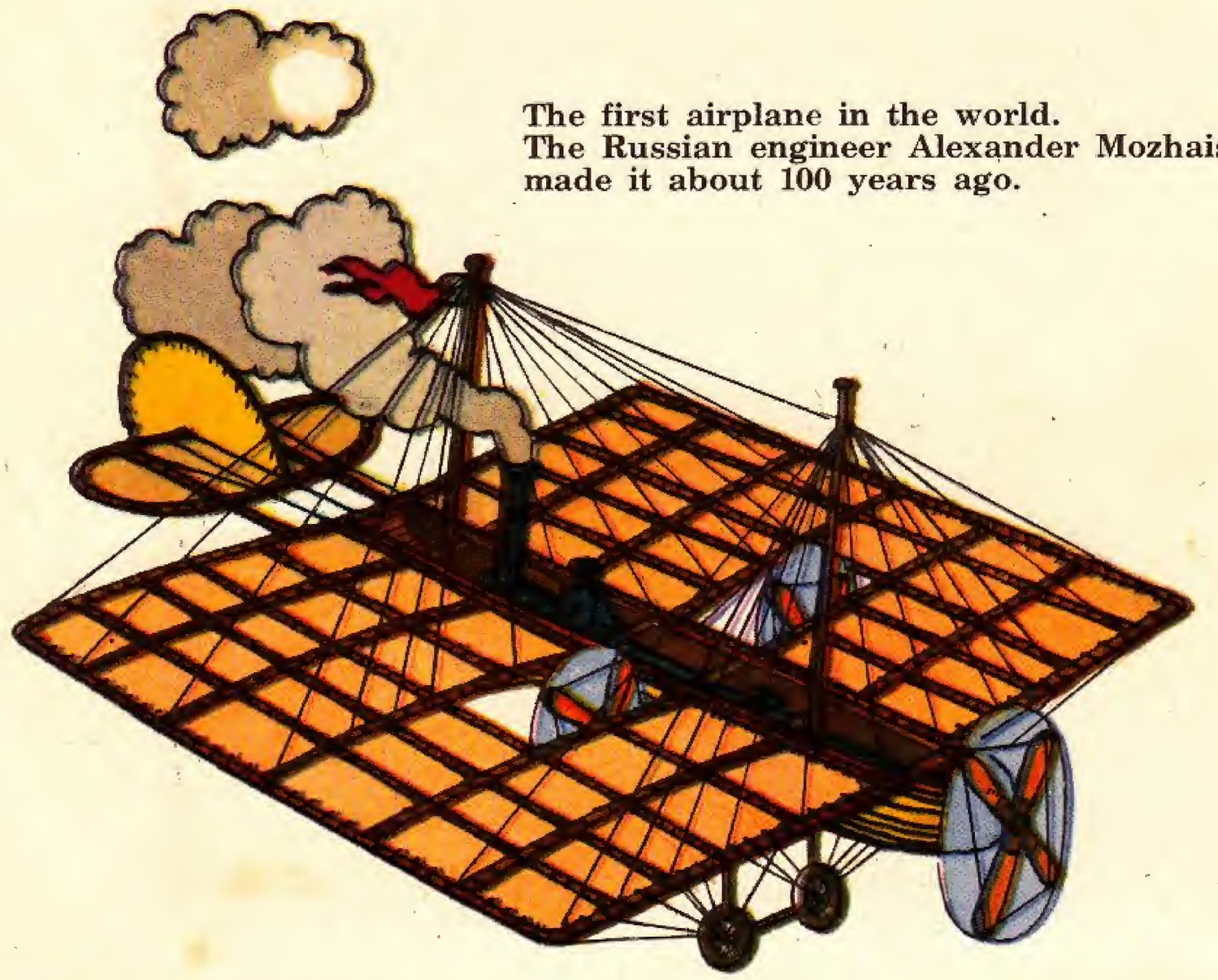


The first gliders
looked like birds
with wings widespread.

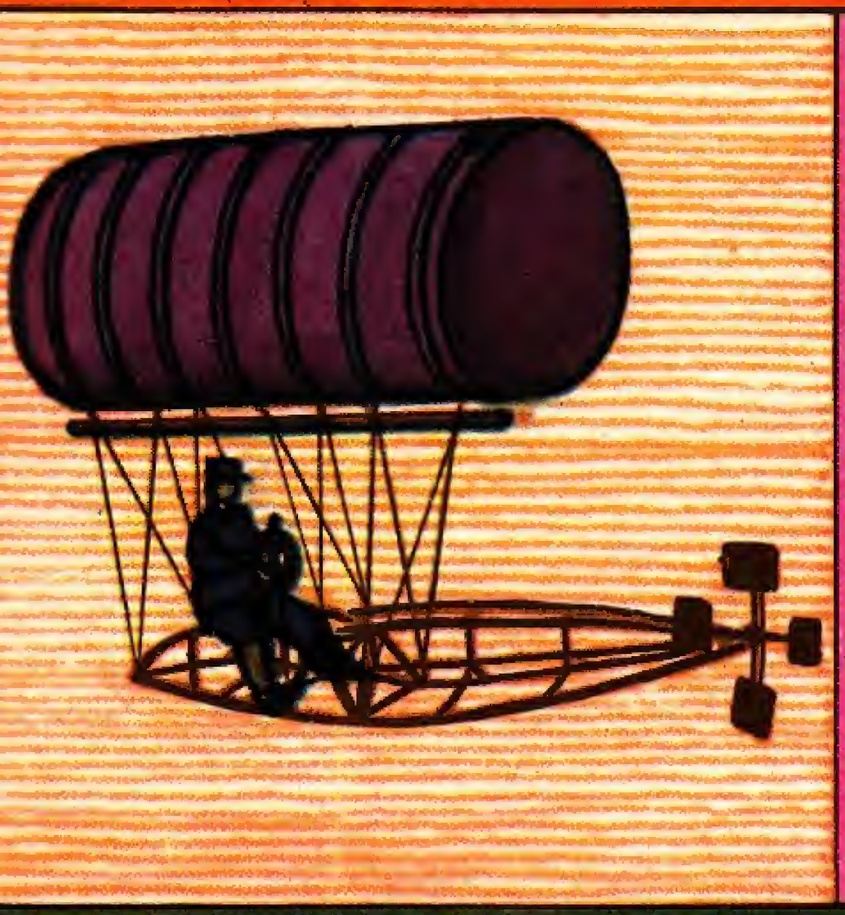
could fly on them. The kites turned into gliders. They were almost airplanes but had no engines. Now people had wings.

But why did they want to fly high in the sky? What gave them the idea? The birds, probably. If there were no birds, people would never have known about wings. They would never have known what flying means.

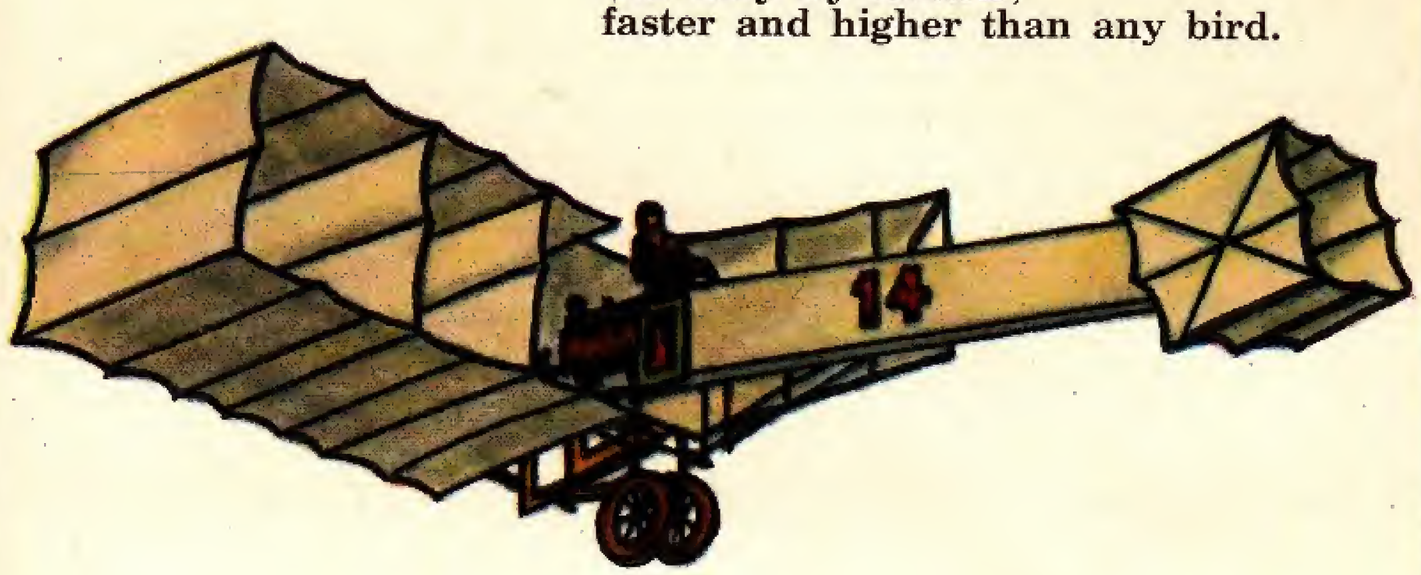
So autumn leaves, large and small birds and the parachutes of dandelions and maple seeds inspired people to invent the kite, glider, airplane, and parachute.

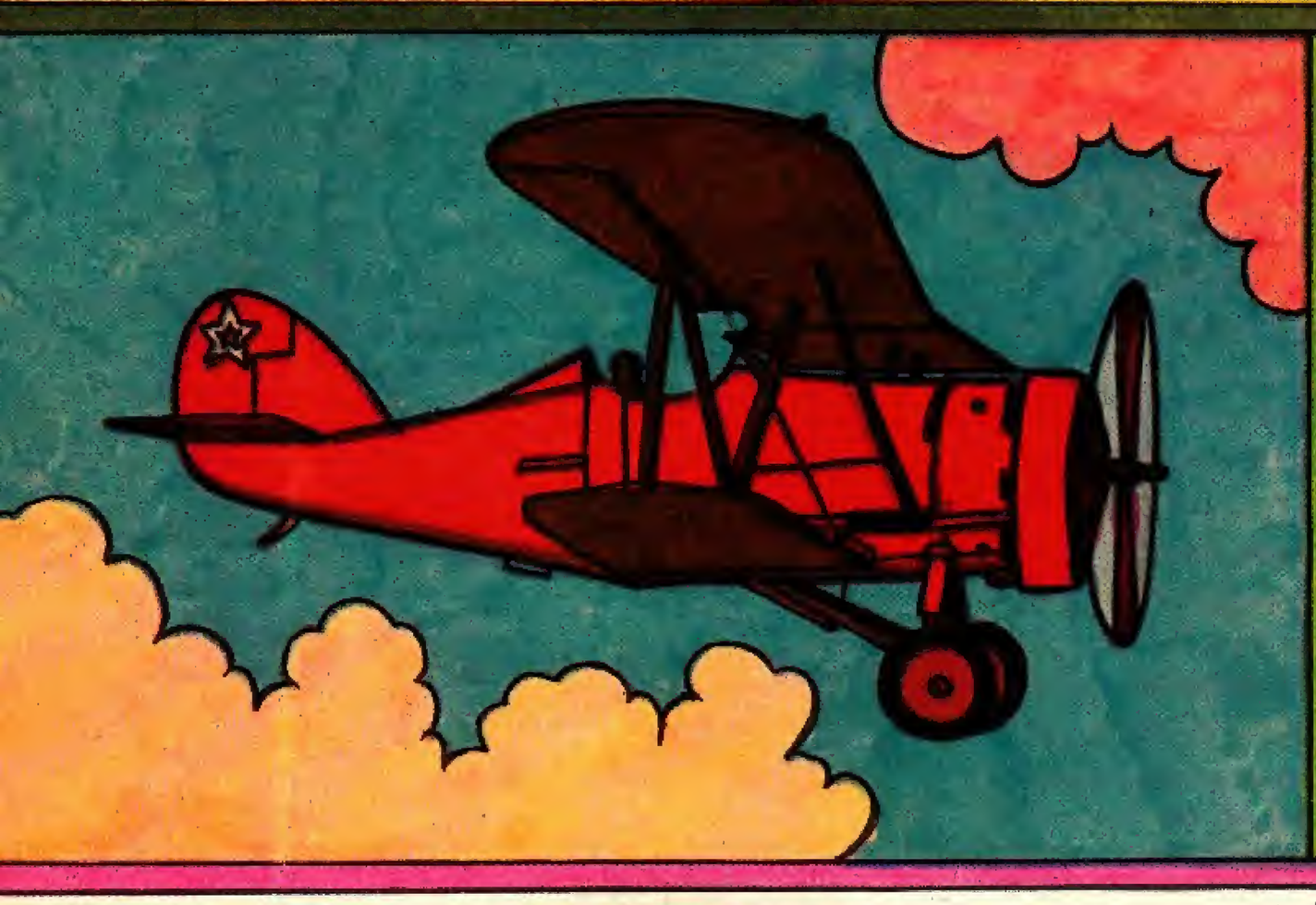


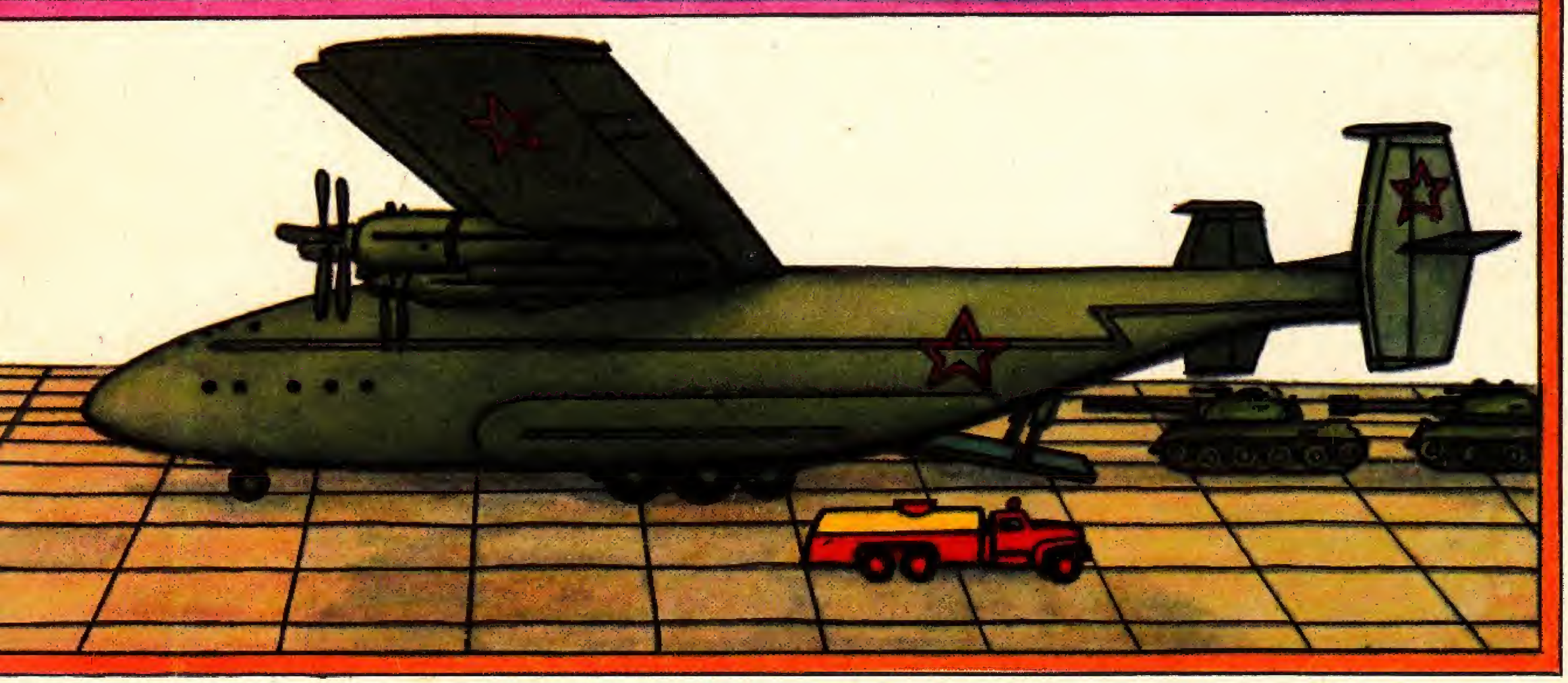
**The first airplane in the world.
The Russian engineer Alexander Mozhaisky made it about 100 years ago.**



All airplanes look like birds.
But they fly farther,
faster and higher than any bird.







HOW THE JELLYFISH PRICKED UP ITS EAR AND WHY THE LIZARD LEFT ITS HOLE

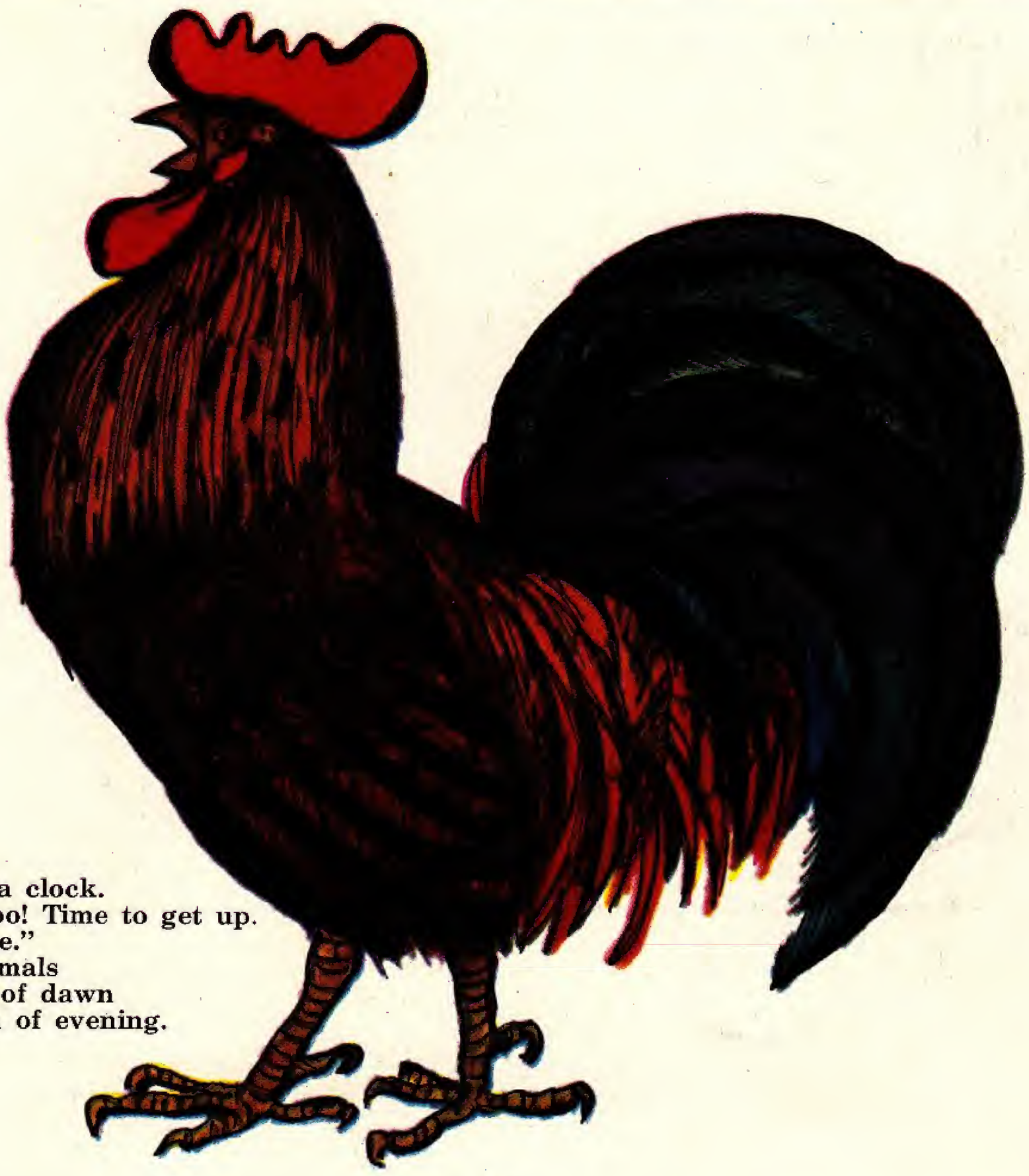
All cats, dogs, geese, sparrows, in fact, many animals and birds can tell what the weather will be. If a kitten sharpens its claws on the wall, rain is coming. If it covers its face with its paws, frosty weather is on the way. But if it rolls on its back with its paws in the air, the days will be warm and dry.

A goose hides its beak under a wing when the weather is about to turn cold. Sparrows hop about in the dust and flap their wings when rain is in the offing. But birds and animals predict more than rain, wind, frost and warm days.

There was a geologist who had a very ordinary sheep dog. Once he was sitting at his desk late in the evening. His baby daughter slept nearby in a pram, and the dog dozed in the corner. All was peace and quiet. Suddenly the dog leapt up, seized the baby by her nightdress, pulled her out of the pram and lunged toward the door. The geologist was terrified. He thought the dog had gone mad. He snatched up his rifle and rushed from the house. Just then the earth shook and the house collapsed. An earthquake had started.

The dog had saved the whole family.

Animals, birds and fish
feel it at once
if the earth gives a slight tremor
or there is sudden dampness
or an unusual smell.
All are like
sensitive instruments.



A rooster is like a clock.
"Cock-a-doodle-doo! Time to get up.
Morning has come."
All birds and animals
sense the arrival of dawn
and the approach of evening.

This happened in the Turkmenian city Ashkhabad. Three days before the earthquake the snakes and lizards left their holes and the pigeons left their lofts.

One night in the Yugoslav city Skoplje there was a great commotion at the zoo. Hyenas screamed, elephants trumpeted, a hippopotamus leaped over the barrier, the birds fluttered about. Early the next morning the earth began to shake.

Animals and birds can feel it when an underground storm is approaching. People may not notice if somewhere far off there is a slight tremor. But dogs, snakes, lizards and fish get excited. They know that something terrible is going to happen.

Even those tiny, transparent jellyfish that look so helpless can tell when a storm is coming up at sea. The sea may be calm. There may be no clouds in the sky. But swarms of jellyfish race for the shore to hide from the storm behind rocks or cliffs or in the quiet of the shallows. Still there is no storm. Have the jellyfish made their dash for safety for no reason whatever? Not at all. Ten or fifteen hours later the ocean begins to rage. The waves rise to the clouds, and the clouds drop to the waves. Now the ocean is boiling.

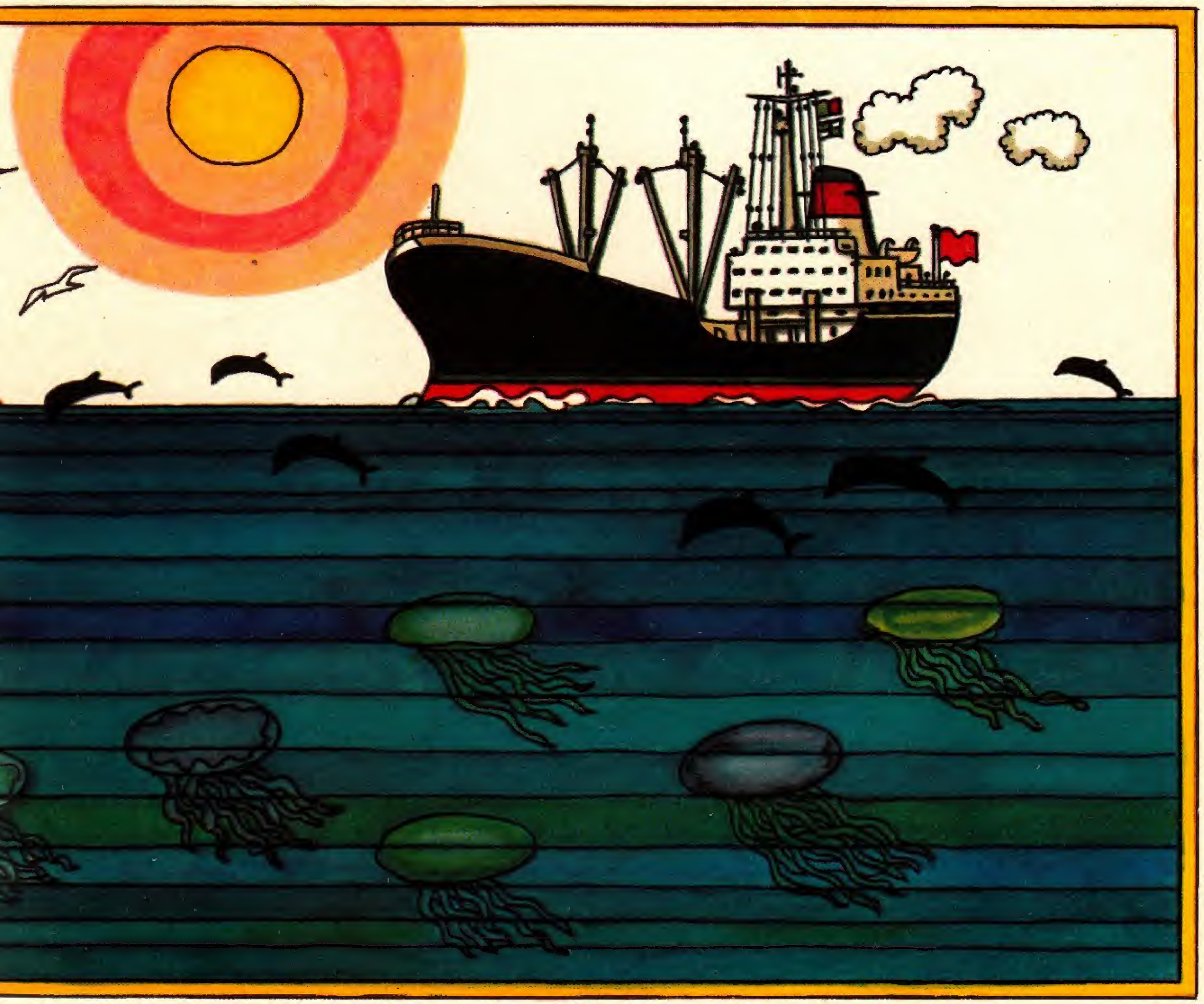
How does the jellyfish feel the approach of a storm?

It has a special ear. This is a small ball filled with liquid and tiny stones. Long before a storm alarming sounds that people cannot hear sweep across the waves. When the sounds reach the ear of the jellyfish, they touch the ball with the liquid and shake the stones. The stones then press on the nerves of the jellyfish

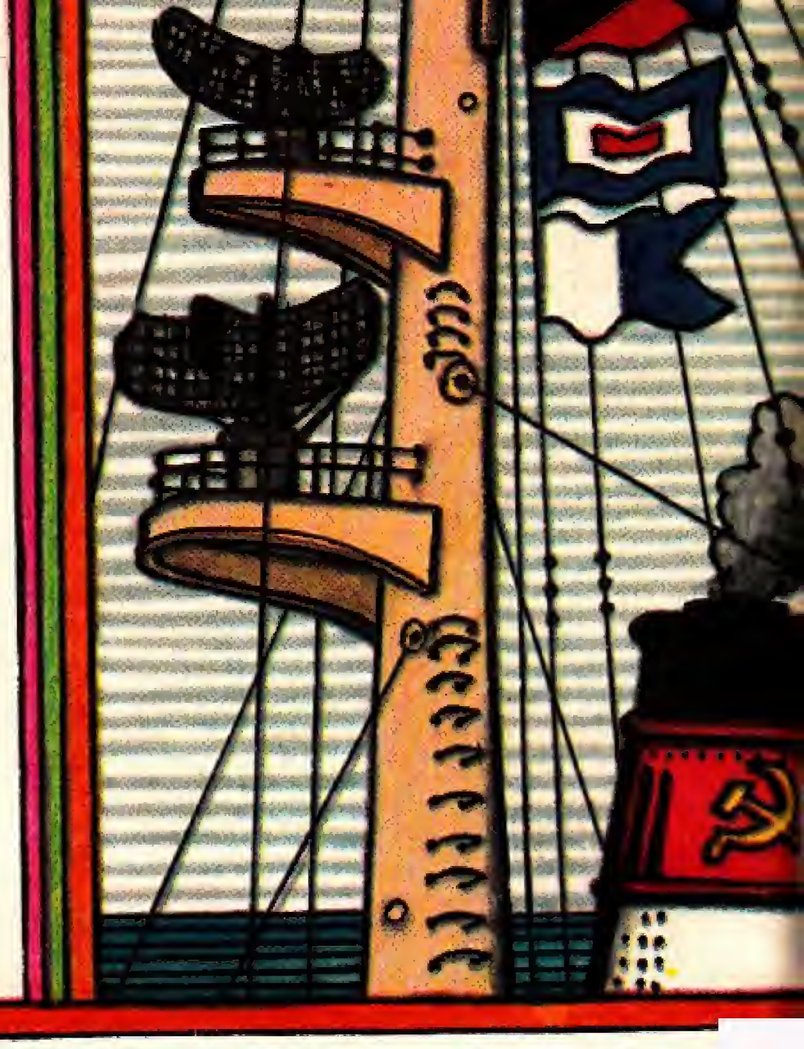
and frighten it. To escape the terrifying sounds the jellyfish rushes to the shallows.

When people discovered how the ear of the jellyfish is constructed, they made an apparatus that predicts storms. This apparatus too is able to hear sounds in the wind and waves that people cannot hear. Fifteen hours before anything happens, it warns the captain of a ship, "Watch out! A storm is coming up."

Engineers learned from the jellyfish how to make an apparatus that saves ships at sea.



HOW THE BAT CAUGHT GNATS, THE TURTLE FOUND ITS FAVORITE ISLAND, AND BUTTERFLIES CROSSED THE OCEAN



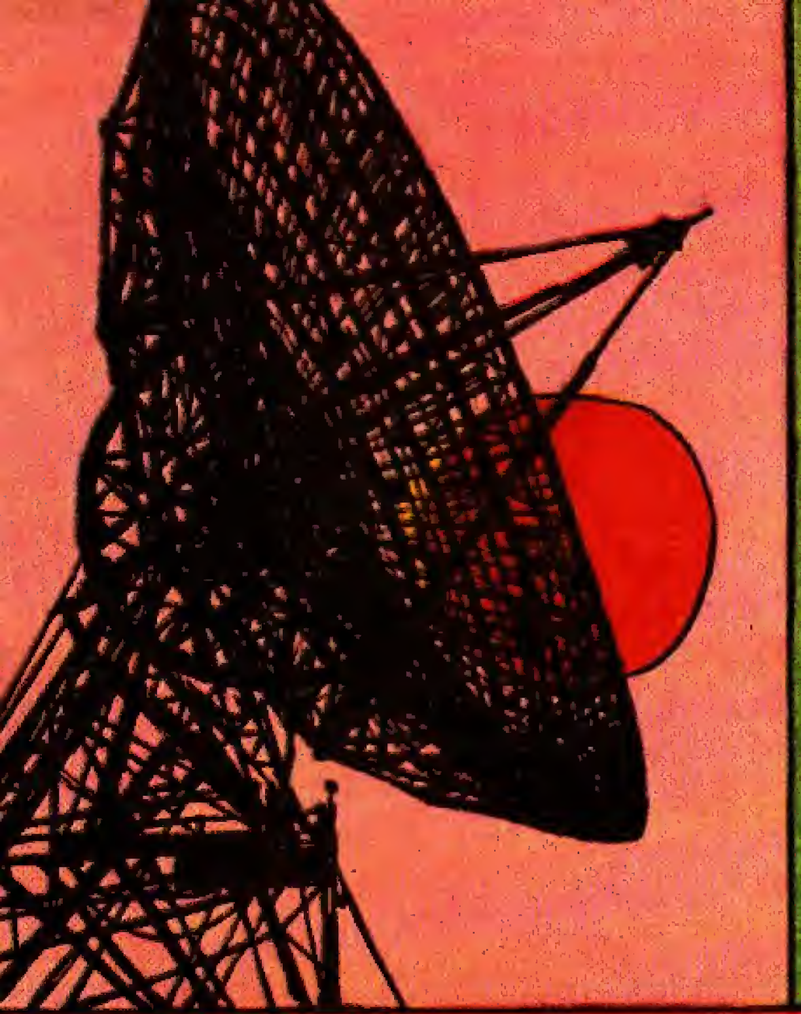
ou can try, try, try,
"But I know how to catch a fly."

This is a song that a bat could sing, if it could sing.

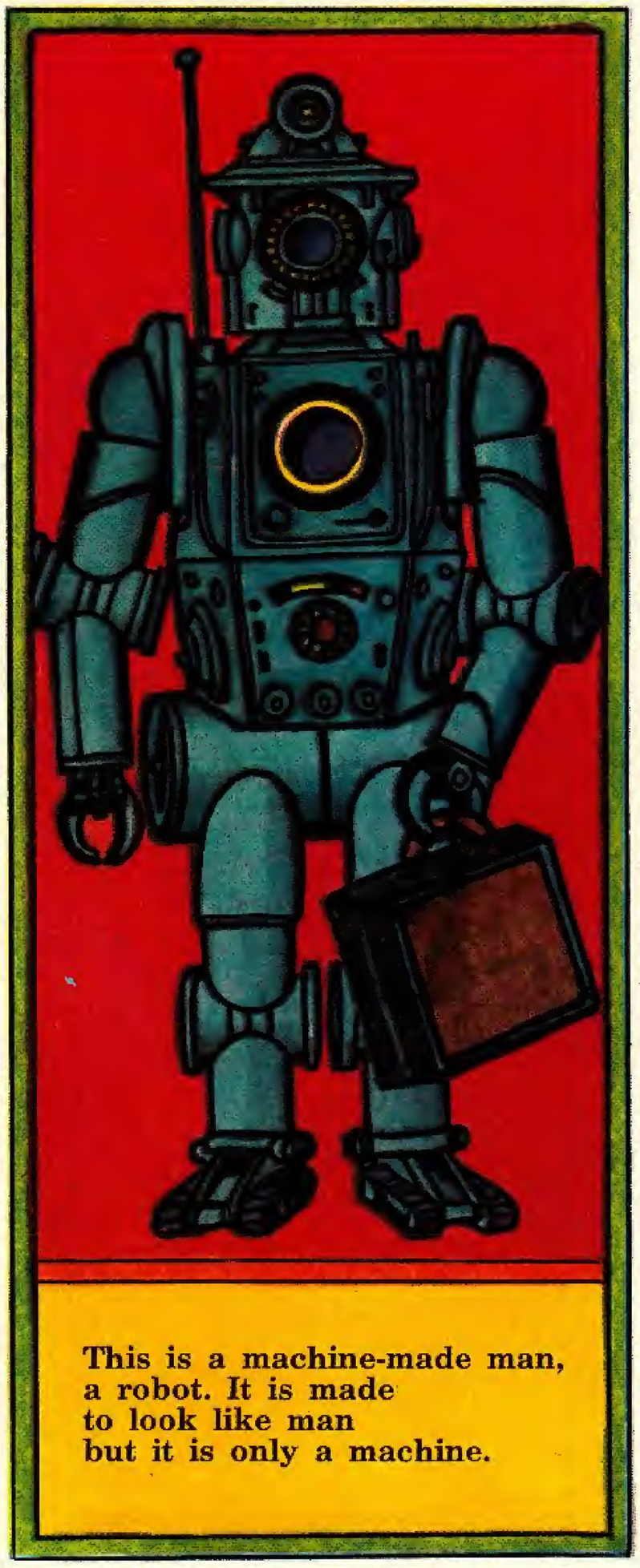
Bats are very good at catching midges, gnats and butterflies. It takes them no time at all. They gobble them up on the wing. A gnat is as tiny as a bread crumb. Yet the bat spots it in total darkness. How? With the help of an echo. Just imagine.

If you stand in a large clearing in the woods and shout very loud, you will hear the shout come back to you, almost as if the woods were shouting back. The sound simply hits the trees and returns. What you hear is an echo.

The bat goes by an echo. As it flies, it whistles. People cannot hear the whistle because it is pitched very high. When the whistle hits a mosquito or gnat or butterfly, it is reflected from the insect and returns to the bat. The bat pricks up its ears. It understands that its prey is near. So the bat



These instruments,
radars, help to spot aircraft
in the sky.
A dolphin in the sea
also uses a kind of radar
when it searches for food
or swims near cliffs.

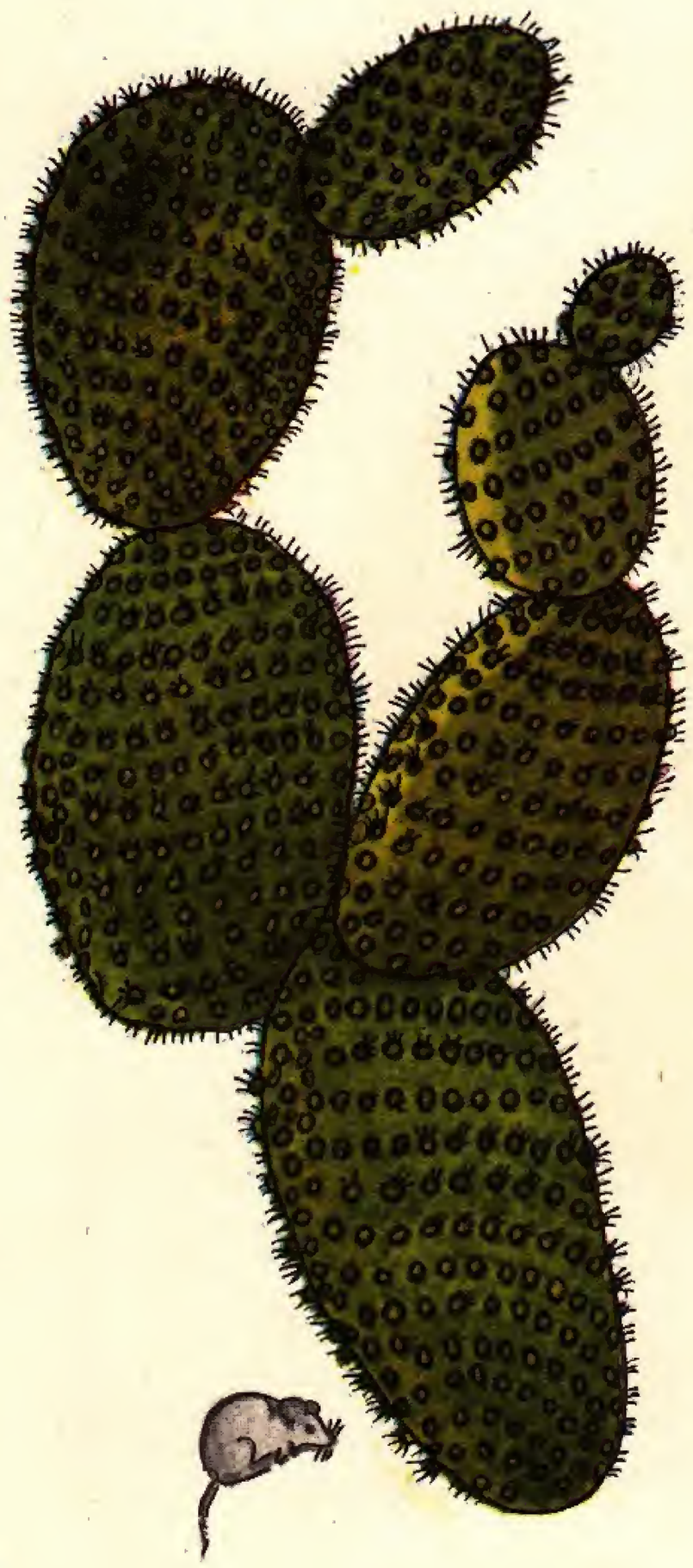


This is a machine-made man,
a robot. It is made
to look like man
but it is only a machine.

catches insects by whistling like a highway robber.

Now let me tell you something still more interesting. Bats live in caves, sometimes in great numbers. As many as twenty million were counted in one

Birds and dogs
always return home.
Butterflies
cross the ocean.



cave. Imagine what happens when they all go out hunting and all whistle at the same time! How is it they don't interfere with each other? How does each one tell its whistle from all the other whistles? We have no answers to these questions yet.

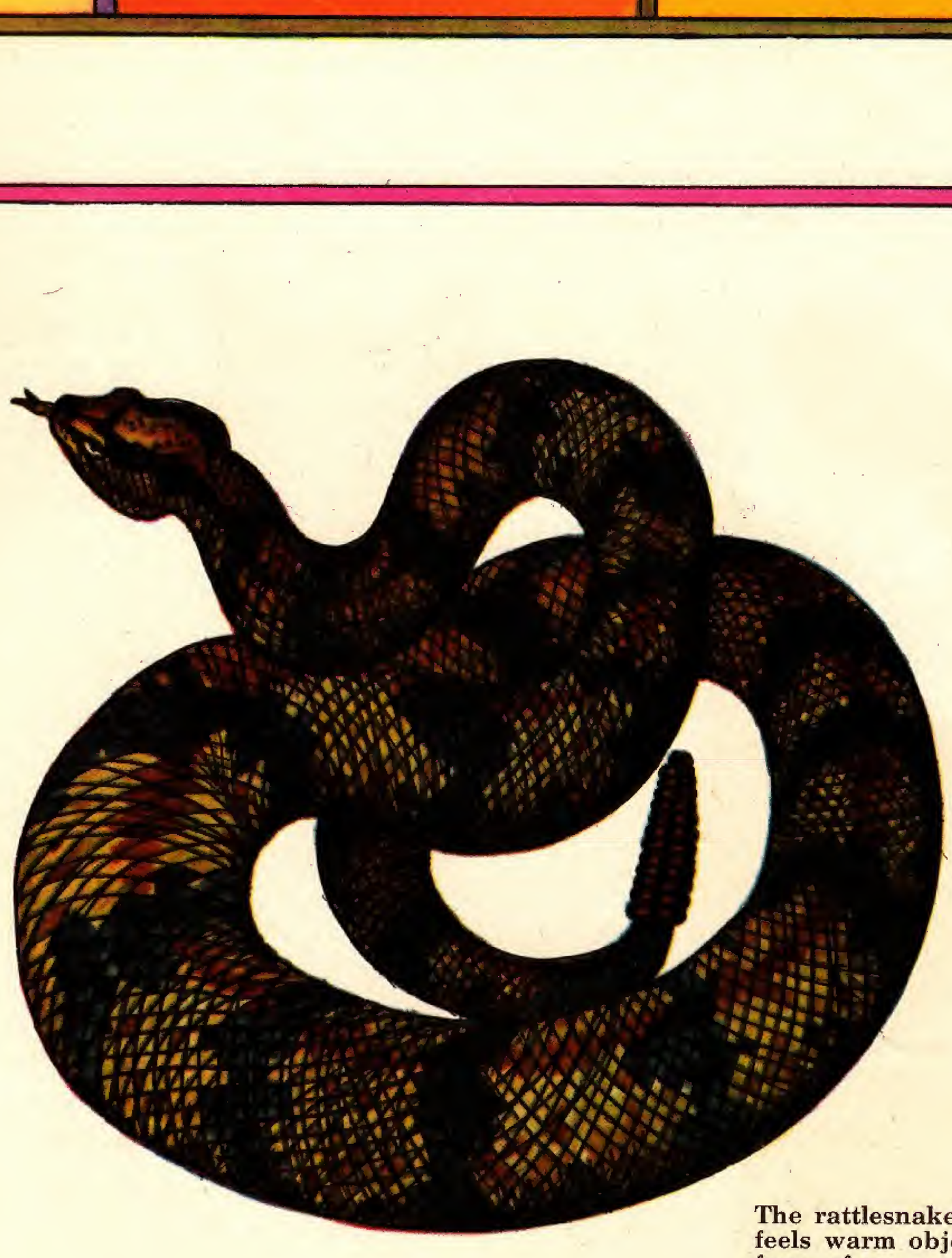
Engineers have long studied bats. They want to make supersonic instruments and radio transmitters and receivers that are just as sensitive. And they want to make transmitters and receivers that can work at the same time and not interfere with each other even if there are thousands of them, in the way that 20 million bats do not interfere with each other.

The rattlesnake too has a clever and sensitive instrument.

The rattlesnake loves to hunt at night. Watch out, all you little mice! The rattlesnake will find you even at night. It will not see or smell you but it will find you, because it feels what is warm, and a mouse is always warmer than the cold leaves and grass

Stars, the sun,
smells, and air currents
help animals
to find their way.
We should learn
from them.

An ant
always knows
its own hill.
Lizards quickly find
their holes.



The rattlesnake
feels warm objects
from afar.
So do grasshoppers
and sharks.

of night. The rattlesnake has tiny holes on its face. These are not eyes or nostrils. They are a very delicate thermometer. With these holes the rattlesnake feels where something is warm and heads straight for it. People do not yet know how to make such a tiny and sensitive thermometer as the rattlesnake has.

The ordinary pussycat has an unusually fine instrument too, its claws. The knife your mother uses in the kitchen can get so dull in just a few weeks that it will not even cut bread but the claws of a cat and the beak of a woodpecker never get dull because they sharpen themselves. Wouldn't it be fine if our factories had drills, cutters, saws and chisels that never got dull or crumbled but sharpened themselves?

The claws of a cat
are always sharp.
It would be fine if we had
such knives and scissors.
A cat can see at night.
If only we could invent
"night spectacles"!

Now back to the ocean again. It seems there are islands in the ocean that grow. These are real islands, but they are made by living creatures, coral polyps. Each polyp has a shell. The polyps live close together but, apparently, do not quarrel. The shells paste themselves to each other and the corals grow higher and higher until there is a coral island.

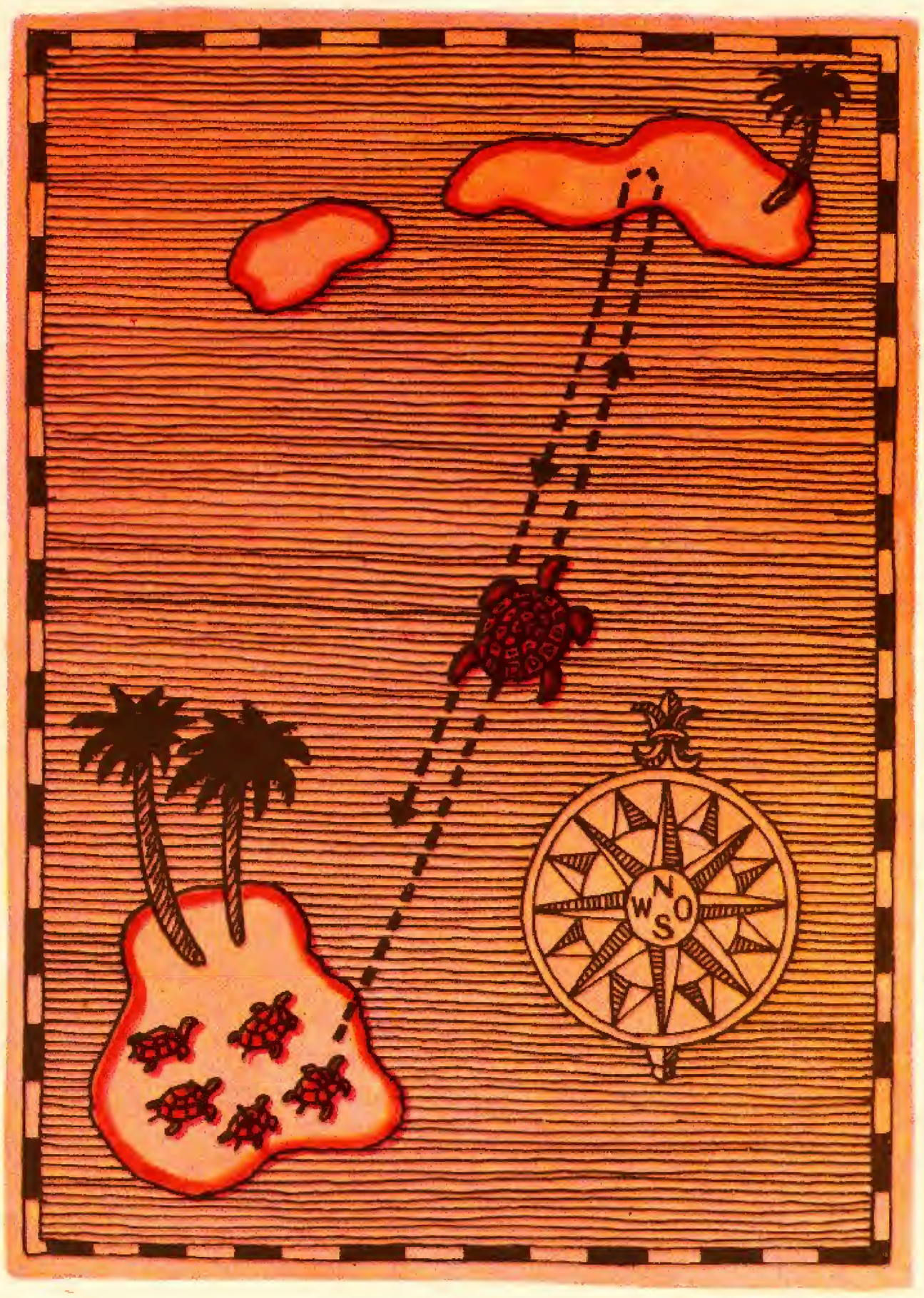
If only people could learn how to make dams and houses grow instead of having to build them! Perhaps we could train corals to build dams and houses and towers on land or invent artificial corals to do all this.

Since we are in the ocean now, let's look around and see what we see. There is a flying fish. It swims under water, slides along on the water and even leaps out of the water. And it does not just leap. It flies through the air. It would be fine if we could make a ship that would leap out of the water, fly over it, sail on it, and dive under it.

Corals or coral reefs absorb the shock of ocean waves and protect shores.

A remarkable worm lives on the ocean bed. It is a very active worm. It moves quickly through the silt by driving its sting into it. Then the sting puts out tiny needles that fasten themselves in the silt and pull the worm along. If we could make a car that could travel underground by pushing a sting of this kind into the ground and so clearing its way,

Turtles always return to their favorite island even if it is far away.



it could search for coal, oil, iron, and silver underground.

The dainty butterfly crosses the ocean fearlessly. The whale travels around the world. Giant sea turtles swim great distances in the ocean and always find their way home.

Why is it that butterflies, whales, and turtles do not get lost? How do they know where to go? How do they know where home is when they are thousands of kilometers away? It would be interesting to find the answers to these questions and put them to use.

People learn from the world around them.